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(54) LACROSSE STICKS

(71) We, WM. T. BURNETT & COMPANY, Inc, a Corporation organised and existing under the laws of the State of Maryland, United States of America of 1500 Bush Steet, Baltimore, Maryland United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:-

This invention relates in general to new and useful improvements in lacrosse sticks. More particularly, it relates to the construction of an all plastic synthetic lacrosse stick head including a pocket integrally molded with the walls of the head. A keeper strap to facilitate ball control can be positioned across the face of the head..

Double-wall synthetic lacrosse sticks are described in Tucker et al, U.S. Patent No. 3,507,495. The introduction of double-wall synthetic lacrosse sticks as defined by the Tucker et al patent has greatly enhanced the popularity of the game of lacrosse with the game becoming more common in intramural and varsity sport programs of secondary schools and colleges. This increased popularity is due primarily to the improved feel, balance, and durability as well as uniformity and economy of manufacture of the double-wall synthetic sticks in comparison to the single-wall, wooden and handmade lacrosse sticks used since ancient times. The introduction of the meshed webbing construction for the pocket of the lacrosse stick described in Tucker et al, U.S. Patent No. 3,822,062 has further simplified the fabrication of lacrosse sticks and permits greater latitude in modifications to individual play.

Although the above-noted construction of lacrosse sticks is highly satisfactory as determined by the substantially universal acceptance of these sticks, it was recognized that the weakest area of the head of the lacrosse stick is that area surrounding or adjacent to holes in the walls of the head for attachment or formation of the web to or on the head. Although breakage of the head as a result of the weakness in the area of hole formation is not substantial, in an effort to perfect or improve the stick design the double-wall lacrosse sticks were constructed or molded with tab means to wholly or in part eliminate the holes in the walls of the stick used to attach or form the web or pocket of the stick. The provision of the tab means eliminating the holes provided a stick having more uniform strength throughout the walls thereof; permitted more rapid attachment or formation of the web to or on the stick head; and, surprisingly, depending on the tab formation and location, imparted improved play characteristics.

The present invention is directed to still further improvements in the fabrication of lacrosse sticks and to improvements which will still further increase the popularity of the game, permitting lacrosse programs in not only secondary school and college intramural and varisty sport programs, but elementary school sport and gym or physical education programs.

According to the present invention, there is provided a unitary head for a lacrosse stick comprising a generally V-shaped plastic molded frame comprising two side walls joined at a juncture and diverging therefrom and a transverse wall joining the ends of said side walls opposite of said juncture, and a plastic webbing integrally molded with said side walls and transverse wall of said frame to form a pocket between and within said side walls and transverse wall. For use of the stick a handle is secured to the head at the juncture of the side walls. Preferably, the juncture is constructed and arranged to removably receive the handle. The unitary head is advantageous in that -

(a) it completely eliminates holes in the

walls for attachment of webbing or the like to form the pocket, thereby eliminating possible weak areas;

(b) the pocket being integrally formed eliminates the need, and thus the time required, to fabricate a pocket by attaching string or mesh; and

(c) cost of manufacuture is reduced in that the entire head is molded in one continuous operation.

Surprisingly, play characteristics are not detrimentally affected and, in fact, the unitary stick permits a high degree of flexibility of play.

More specifically, modification to play characteristics is obtained not only by the size or depth of the pocket, also capable of accomplishment with string and mesh, but by modification of the synthetic plastic used in fabricating the head. By changing the polymeric material the properties of the head can be adjusted in weight and from varying degrees of rigidity to varying degrees of flexibility which, in turn, affects the play characteristics and, more importantly, permits a wider latitude of play conditions. Usually the more rigid heads are best chosen for play under normal field lacrosse conditions. Flexible heads, on the other hand, are more suitable for indoor areas, i.e., in gymnasiums, and are preferred for play with younger players where injury by being struck with a stick is more of a danger. The integral molding permits fabrication of sticks which are very light in weight, but still possess a high degree of, and the nescessary, strength. Flexibility of play, permitting play by inexperienced players including the young player, is further enhanced by the inclusion of a keeper strap across the open face of the plastic head in the vicinity of the juncture. The keeper strap helps in the control of the ball building confidence in the player.

Because of the varying physical properties, including lightness, and also the relative inexpensiveness of manufacture of the all plastic lacrosse stick head, the game of lacrosse and variations thereof can be greatly expanded. As noted hereinbefore, prior to the introduction of double-wall lacrosse sticks as disclosed in Tucker et al, U.S. Patent No. 3,507,495, the game of lacrosse was largely limited to varisty sport programs of select colleges. With the advent of the double-wall stick, the popularity of lacrosse increased tremendously and expanded into varsity and intramural sport programs of most colleges and a number of secondary schools. However, the game has still not gained acceptance in many secondary schools or in most elementary schools. It is believed this lack of acceptance been largely due to the initial cost of the stick and replacement cost of broken sticks, as well as fear of injury to players as a result of being struck with a stick. As a result of the present invention, however, the cost of the stick is substantially reduced through integral molding of the head and safety of play on varying surfaces is assured due to the varying physical characteristics possible with the stick head. The present unitary stick permits the game of lacrosse, or a modification thereof, to be played in gym classes made up of even young children under indoor or outdoor conditions. The use of light, shatterproof, plastic heads not only substantially precludes possible injury, but eliminates physical damage to indoor, hardwood, or the like playing areas. Accordingly, through this invention lacrosse is now available as a valuable tool to gym instructors in teaching coordination, dexterity, and motor skills in general.

The plastic or polymeric material which is to be used in accordance with the present invention is critical to the extent that it must have as physical properties stength, toughness, abrasion resistance, as well as the desired flexibility in the finished lacrosse stick. The materials highly preferred are urethane elastomers made from reactants which are normally blended in the liquid state and cast or injected into suitable molds where they are heated to produce the desired unitary lacrosse stick. These urethane elastomers are preferably derived from polyester and/or polyether glycols reacted with organic polyisocyanates and cured with low molecular weight polyols or polyamines. For example, cast elastomers based on poly(1,4-oxybutylene)glycol and toluene diisocyanate react to form prepolymers containing isocyanate groups. The prepolymer is further cured with an organic diamine such as 4,4'methylene-bis-(2-chloroaniline) to provide the final article. Preferred urethane elastomers are those marketed under the E.I. duPont de-Nemours & Co. trademark SURLYN which are ionomer resins and particularly those suitable for injection molding such as SURLYN 1555 and 1560. Others are manufactured by duPont under the HYTREL trademark. Additionally, the polyurethane resins marketed by the duPont under the trademark ADIPRENE are particularly suitable for cast molding in contradistinction to injection molding. These urethane elastomers produce molded stick heads having the essential strength, toughness, abrasion resistance, and flexibility essential for the sticks. More specifically, stick heads are obtained with the polymeric material having a hardness on the Shore Durometer ranging from about 20D to about 100D, and preferably from about 50D to about 77D; abrasion resistance based on the National Bureau of Standards Index of from about 250 to about

550, and preferably from about 300 to about 500; impact resistance based on the American Society of Testing Materials (ASTM) D256-56, method A; notched Izod of from about 7 to about 22, and preferably from about 10 to about 20; and a resiliency (rebound Bashore) percentage of from about 30 to about 55, and preferably from about 40 to about 50 percent.

In addition to the excellent physical properties imparted to the integral stick heads by the urethane elastomer, the ability to utilize liquid casting techniques and/or injection molding depending upon the resin selected makes the urethanes particularly advantageous. In one preferred process a two-piece mold made for a solid impervious material such as a solid urethane elastomer is filled through a fill hole in the mold with a liquid urethane elastomer such as ADIPRENE L-315, a urethane elastomer marketed by duPont as a prepolymer based on poly(1,4-oxybutylene)glycol and toluene diisocyanate (100 parts) and 4,4'methylene-bis-(2-chloroaniline) (26 parts) after a thorough mixing and addition of pigment, if desired. The filling preferably is accomplished within a short period, for example 15 to 20 seconds, to avoid undue viscosity build-up. The mold is then moved into a heating chamber and held at 100°C. for 15 to 20 minutes. During this period the liquid urethane components gel into a rubbery solid having sufficient tenacity and flexibility that the stick being molded can be demolded easily before the polymer has attained its maximum hardenss. In this manner not only is the demolding facilitated, but the molding cycle is shortened which enables greater and more efficient use of the molds. Thereafter the article is further cured at 100°C. for two to three hours to ensure complete cure and optimum properties. As will be apparent to one skilled in the molding art, the temperatures are not critical and depend to a large extent upon the particular polymers used.

In an alternative preferred process, the integrally formed lacrosse stick head is formed by injection molding a suitable resin into a mold using conventional injection molding techniques.

Although the urethane polymers are preferred, it is possible to use other polymers including polyethylene and polyproplene resins, or a combination of resins. The essential feature is to obtain the necessary strength, abrasion reisitance, hardness, and flexibility as noted hereinbefore.

In the drawing, where like parts of the various embodiments are designated by like numerals.

Figure 1 is a view from the open face of a lacrosse stick according to this invention showing the handle partly broken away;

Figure 2 is a side view of the integrally molded head only;

Figure 3 is a sectional view taken along line 3-3 of Figure 1;

Figure 4 is a top, rear view of a second embodiment of the lacrosse stick according to this invention;

Figure 5 is a top view of the stick of Figure 1, including a keeper strap;

Figure 6 is a fragmented view of the stick of Figure 1 showing a second embodiment of the keeper strap; and

Figure 7 is a fragmented view of the stick of Figure 4 showing still another embodiment of the keeper strap.

Referring to the various views, head 10 comprises side walls 12 and 14 joined at juncture 16 and a transverse wall 18 connecting the side walls at the end opposite of the juncture. In the design shown, stop means 20 is spaced from juncture 16 toward transverse wall 18. A plastic webbing or mesh 22 is integrally molded with and connected to the side and transverse walls and to stop means 20 to form a pocket to, in co-operation with the side walls, transverse wall, and stop means, receive and hold a ball and to control the throwing of the ball. The drawing establishes a preferred ratio and depth of pocket. However, modification can be made and good play characteristics still obtainable. For example, for indoor play it may be desirable to use a ball larger than the normal lacrosse ball. Such balls may be of a flexible polyurethane or like material, or hollow plastic. In such expediency it may be desired to vary the depth of the pocket, or the like.

It is belived the ability to integrally mold the entire stick head to provide the requisite properties, while obtaining good play characteristics, is due to having stop means 20 forward of juncture 16, and integrally and fixedly molding the stop means with the webbing or mesh in the formation of the pocket. This feature provides the essential properties and permits the adequate control of the pocket means to permit accurate and uninhibited play.

Figures 5 - 7 illustrate the lacrosse stick head of the present invention showing keeper strap 30 positioned across the face of the lacrosse stick. As shown in Figure 5, the keeper strap contains snap buttons 32 on each extreme end of the strap. One end of the strap is passed through webbing 22 around one of the first side walls, across the face of the stick head, around the second of the side walls, and attached at the second end to webbing 22. The keeper strap is so positioned as to protect and partially cover the pocket of the stick head formed by the juncture, stop, side walls, and webbing. Some latitude can be exercised in positioning the keeper strap depending upon the

preference of the individual player. Preferably, however, the keeper strap will be positioned substantially as shown in Figure 5. Figure 6 illustrates a second embodiment as to the manner of attaching the keeper strap. Figure 7 illustrates still a further embodiment of the keeper strap. According to the embodiment of Figure 7, a tab 36 is integrally molded on each side wall of the integrally molded plastic head. Tab 36 has a lip 36*a*. A plastic strap 30 having an opening is snapped onto tab 36, engaging lip 36*a*, and stretched across the face of the stick head and snapped in place on the opposite side wall. It is possible according to this embodiment to injection mold the keeper strap 30 along with the entire head of the lacrosse stick using a weakened break-away design.

It is also possible to integrally mold the keeper strap in place as part of the stick head during the injection molding. If such expediency is followed, the keeper strap will not be replaceable, but can be permanently removed if desired after the player using the stick acquires the essential skill and feels he no longer needs the keeper strap.

The preferred material of the strap if detachable is flexible vinyl. It can be desirable to have the strap adjustable to conform to balls of different size.

The keeper strap has been found to contribute substantially to the control of the ball used in the lacrosse game, thereby building the confidence of the inexperienced or young player. As is apparent, however, in the event the player should decide that the keeper strap is not desirable it can be readily removed. In the case of its being integrally molded, it can be cut from the stick head using a knife or other suitable tool.

It will be apparent that various modifications can be made in the inventive concept expressed herein. A particularly advantageous feature is having the juncture and stop means cooperate to receive and hold in place a removable handle which may be of wood, plastic, or a light metal such as aluminum. However, it is possible to integrally mold the handle and head in one operation. Moreover, as will be apparent, the dimensions of the side and transverse walls as well as the stop means can be varied to meet particular applications.

WHAT WE CLAIM IS:

1. A unitary head for a lacrosse stick comprising a generally V-shaped plastic molded frame comprising two side walls joined at a juncture and diverging therefrom and a transverse wall joining the ends of said side walls opposite of said juncture, and a plastic webbing integrally molded with said side walls and transverse wall of said frame to form a pocket between and within said side walls and transverse wall.

2. A unitary head according to Claim 1 having stop means spaced from said juncture, the plastic webbing being integrally molded with said stop means, as well as with said side walls and transverse wall, to form a pocket between and within said side walls, transverse wall, and stop means.

3. A unitary head according to either of Claims 1 or 2 wherein the juncture is constructed and arranged to removably receive a handle.

4. A unitary head according to any one of Claims 1 to 3 wherein the plastic is a polyurethane.

5. A unitary head according to any one of Claims 1 to 4 wherein the head is made by injection molding.

6. A unitary head according to any one of Claims 1 to 5 including a keeper strap positioned across the face of the lacrosse stick constructed and arranged to partially enclose the pocket.

7. A unitary head according to claim 6 wherein the keeper strap is attached by snap buttons.

8. A unitary head of Claim 6 wherein the keeper strap is integrally molded with the unitary head.

9. A unitary head for a lacrosse stick, substantially as hereinbefore described and illustrated by reference to the accompanying drawings.

10. A unitary head for a lacrosse stick when produced by a method substantially as hereinbefore described.

11. A lacrosse stick comprising a unitary head according to any one of Claims 1 to 10 when fitted with fitted with a handle.

ALAN TROMANS & CO.,
Agents for the Applicants,
7 Seymour Road,
London N3 2NG.

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1589596 COMPLETE SPECIFICATION

4 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

FIG. 1

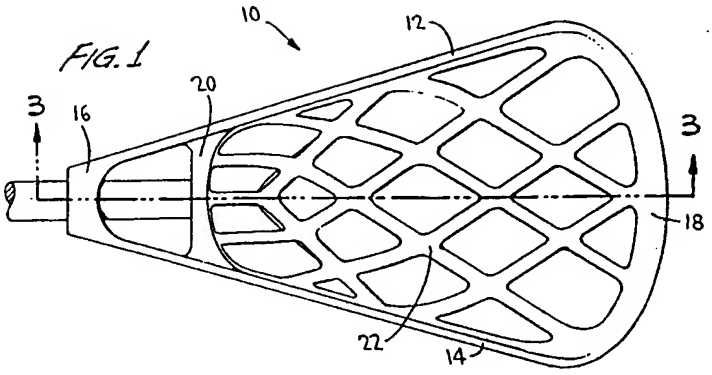


FIG. 2

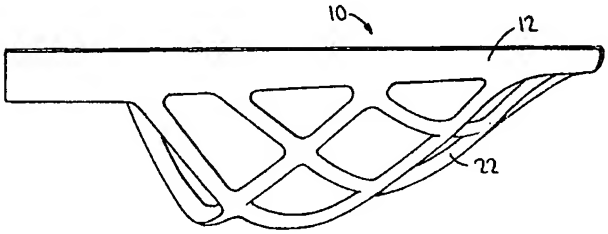
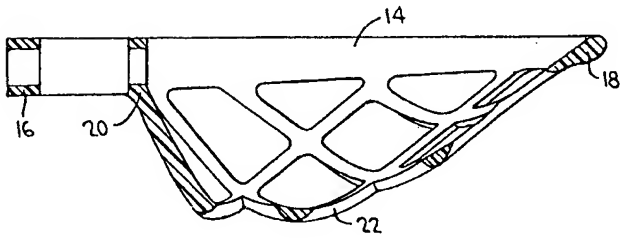


FIG. 3



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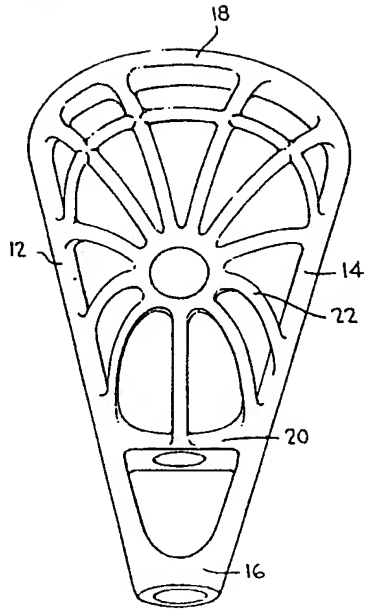
Sheet 2

FIG. 4



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Sheet 3

FIG. 5

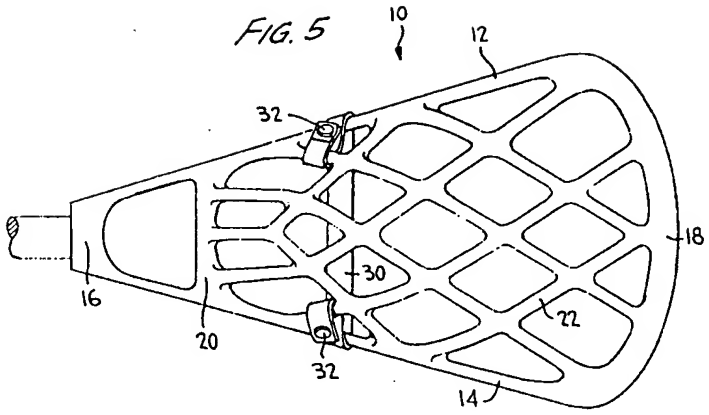
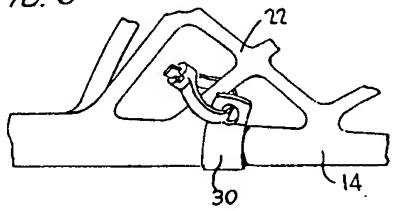


FIG. 6



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Sheet 4

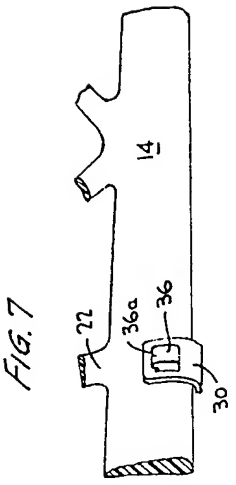

FIG. 7

FOR DISCUSSION PURPOSES ONLY
NOT FOR ENTRY ON THE RECORD

Agenda

- Neither Miyamoto nor Feeney appear to teach a lacrosse stick having a stem and a head frame "integrally fabricated by injection molding." Both appear to teach manufacturing processes other than injection molding. (Miyamoto, col. 2, ll. 61-65; Feeney, col. 4, ll. 5-21, 33-46). Therefore, Applicant respectfully requests that the rejection of claim 6 be withdrawn.

- As neither Miyamoto nor Feeney (nor any of the other cited references) appear to teach the "injection molding" limitation, as noted above, Applicant amends claim 1 to claim a lacrosse stick wherein "the stem and head frame shar[e] at least a common continuous exterior material so as to define a unitary structure, wherein at least one of the head frame and the stem is fabricated by injection molding." Therefore, Applicant respectfully requests allowance of claim 1 as amended.

- Applicant renews the arguments presented in the Responses filed on April 14, 2005, with the RCE. The flexibility that the Examiner seems to refer to is cross-sectional flexibility (i.e., a thinner cross section is more flexible than a thicker cross section). Applicant claimed a difference in material flexibility (i.e., materials having the same properties display the same material flexibility, notwithstanding cross-sectional thickness). Therefore, Applicant respectfully requests allowance of claim 1 as amended in the Response dated April 14, 2005.

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